emulating a credit card being inserted into the card slot. This allows the attacker to withdraw money from the victim's card information even if the victim's card is a chip-and-PIN card, which has been considered more secure than the classic magnetic strip card. So, the question now is: what are we going to do to prevent such attacks?

CONCLUSION

Black Hat USA has completed its 19th year. We have learned much of what we needed to know about recent cybersecurity risks, threats, and trends. However, this does not mean that we will be one step ahead of attackers. We need to think as like attackers if we want to develop secure software.

—Jong-Hyouk Lee

IEEE CESoc TV: High-Efficiency Video Coding

IEEE CESoc TV is the YouTube broadcast channel of the IEEE Consumer Electronics (CE) Society. The channel began in 2012, and as of 24 August 2016, the CESoc TV videos were viewed 55,226 times. CESoc TV watch time was 133,986 min, or more than 2,233 h or 93 d. The watch time increased by 4.7% in fewer than eight weeks. CESoc TV is like TV-on-demand with a collection of programs previously recorded. It can be found at https://www.youtube.com/user/ieeeCESocTV.

You can always access CESoc TV if you type "ieee cesoc tv" into a search engine. This collection of videos is a source of knowledge for those who would like to know more about CE. The focus of this article is high-efficiency video coding (HEVC).

First, I would like to recommend the video of the keynote presentation of the ICCE-Berlin 2012, "Standardization of High-Efficiency Video coding (HEVC)." This video has the largest watch time on CESoc TV: 18,028 min. It can be found at https://youtu.be/63YV7LwQBes.

You can also find this video on CESoc TV by following these steps:

- select "Playlists" on the home page of CESoc TV
- find the "IEEE CESoc TV: Archive" group of playlists
- click the playlist "ICCE–Berlin 2012: Archive"
- look for the video "Standardization of High-Efficiency Video Coding (HEVC)."

Prof. Jens-Rainer Ohm presents "Standardization of High-Efficiency Video Coding (HEVC)" (available at https://youtu.be/63YV7LwQBes).

Before I reveal the author of the ICCE-Berlin 2012 keynote, I would like to focus on the history of HEVC, which is the latest in the series of video compression standards developed jointly by ITU-T VCEG and ISO/IEC MPEG. The HEVC project was formally launched in January 2010 through a call for proposals issued as common text by both organizations. Since April 2010, the standard has been developed by the Joint Collaborative Team on Video Coding (JCT-VC), a group of video coding experts from ITU-T Study Group 16 (VCEG) and ISO/IEC JTC 1/SC 29/WG 11 (MPEG) created to develop a new generation video coding standard. The JCT-VC is cochaired by Jens-Rainer Ohm and Gary Sullivan.

Ohm was the author and presenter of the ICCE-Berlin 2012 keynote, "Standardization of High-Efficiency Video Coding (HEVC)." He is also the chair of the Institute for Communications Engineering at RWTH Aachen University, Germany. Since 1998, Ohm has participated in the work of the ISO/IEC JTC1/SC29/WG 11 Moving

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Dan Grois presents "HEVC/H.265 Video Coding Standard including Range, Scalable, and Multiview Extensions" (available at https://youtu.be/TLNkK5C1KN8 https://youtu.be/V6a1AW5xyAw).

Benjamin Bross speaks to attendees during "HEVC/H.265 Video Coding Standard including Range, Scalable, and Multiview Extensions" (available at https://youtu.be/TLNkK5C1KN8 https://youtu.be/V6a1AW5xyAw).

Pictures Experts Group (MPEG), where he has been contributing to the development of the MPEG-4 (part 2 Video, part 10 AVC) and MPEG-7 standards. He has been the chair of the MPEG Video Subgroup since May 2002. From January 2005 until November 2009, he was also cochairing the Joint Video Team (JVT) of MPEG and ITU-T SG16/WP3/Q6 VCEG, together with Gary Sullivan of Microsoft. Currently, both are again cochairing JCT-VC of MPEG and VCEG, with an intended mandate of developing the next generation of HEVC technology.

By watching the video "Standardization of High-Efficiency Video Coding (HEVC)," you have a unique opportunity to learn about HEVC from one of the key figures of the HEVC project. The overview of this keynote presentation includes:

- an introduction
- the history and timeline of HEVC development
- the current status of development
- a performance assessment
- HEVC further development
- outlook.

Ohm starts his presentation by formulating the major goal of the HEVC project, which is to develop the next-generation video coding standard that could achieve the same level of subjective video quality with substantial savings (reduction by half) relative to the bit rate required by the current Advanced Video Coding (AVC) standard (ITU-T Rec. H.264 | ISO/IEC 14496-10). The presentation summarized the status of the HEVC development and gives an overview about the technology included in the standard. In comparison to AVC, larger variable-size block structures (called coding units) are used with associated prediction and transform structures. More advanced tools are used for motion-compensated and intra prediction. Several elements such as entropy coding are similar or even simplified compared with AVC, such that the overall complexity is not exhaustive. Specific measures for supporting parallelism are also an inherent part of the design. Ohm shows the results of the initial measurements of the capability of HEVC. These results indicate that the performance of HEVC is meeting the targets set by the goal of the HEVC project.

Application areas of the standard are foreseen in a multitude of areas, where increasing resolution and quality demand urges for improved compression. The draft of the first version targeted for 2013 foresees only one profile, such that identical decoding devices could be employed for various consumer oriented services such as broadcast, video download, and streaming, both for fixed and mobile networks, or for storage. In short, HEVC has the potential to have a major influence on anything related to digital video over the next decade. Ohm also provides an outlook toward further extensions which are prepared in the areas of professional, scalable, and stereo/3-D video coding, expected to emerge in subsequent versions and additional profiles.

A draft standard of HEVC was finalized in 2012. Important results of the development of HEVC were presented at ICCE–Berlin 2012. I recommend videos of other presentations dedicated to HEVC given at ICCE-Berlin 2012 including:

- "Fast Motion Estimation Algorithm for HEVC" by N. Purnachand (University of Aveiro, Portugal), Luis Nero Alves (Universidade de Aveiro & Instituto de Telecomunicações, Portugal), and Antonio Navarro (University of Aveiro, Portugal), available at https://youtu.be/jFcsGEtT3N4
- "Quadtree Structures and Improved Techniques for Motion Representation and Entropy Coding in HEVC" by Benjamin Bross (Fraunhofer HHI, Germany), Philipp Helle (Fraunhofer HHI, Germany), Simon Oudin (Fraunhofer HHI, Germany), Tung Nguyen (Fraunhofer HHI, Germany), Detlev Marpe (Fraunhofer HHI, Germany), Heiko Schwarz (Fraunhofer

HHI, Germany), and Thomas Wiegand (Fraunhofer HHI, Germany), available at https://youtu.be/lKVYfGNY4LM

- "Fast Adaptive Loop Filter Algorithm for High-Efficiency Video Coding" by Hsuan-Hung Chen (National Taiwan University, Taiwan), Sung-Fang Tsai (National Taiwan University, Taiwan), Chung-Te Li (National Taiwan University, Taiwan), Pei-Kuei Tsung (National Taiwan University, Taiwan), and Liang-Gee Chen (DSP/IC Design Lab, National Taiwan University, Taiwan), available at https://youtu.be/mg5Gw9ha9go
- "Fast Coding Algorithm Based on Adaptive Coding Depth Range Selection for HEVC" by Jong-Hyeok Lee (SunMoon University, Korea), Chan-Seob Park (SunMoon University, Korea), and Byung-Gyu Kim (SunMoon University, Korea), available at https://youtu.be/tOA8bGq8_yI.

The first version of HEVC presented in Ohm's keynote was finalized in the very beginning of 2013 for approval in both ITU-T and ISO/IEC. This new standard was approved on 13 April 2013 and was published as twin text by ITU, ISO, and IEC as ITU-T H.265 | ISO/IEC 23008-2.

HEVC is able to meet the growing need for the higher compression of moving pictures for various applications, such as Internet streaming, communication, videoconferencing, digital storage media, and television broadcasting. HEVC applications in network communications were analyzed in a tutorial presented at the ICCE in January 2015. This tutorial, "Challenges in HEVC Based Video Communications in LTE-A and Beyond Wireless Networks," was presented by Anil Fernando and Thanuja Mallikarachchi, University of Surrey, United Kingdom. Fernando is the head of Video Communications Group at the University of Surrey. This group is a key player in many European Union projects. By watching the video of the tutorial, you can get a new perspective on HEVC applications. This video can be found at https://youtu.be/3AQQ4JPR4rY.

> By watching the video "Standardization of High-Efficiency Video Coding (HEVC)," you have a unique opportunity to learn about HEVC from one of the key figures of the HEVC project.

Karsten Suehring presents "HEVC/H.265 Video Coding Standard including Range, Scalable, and Multiview Extensions" (available at https://youtu.be/TLNkK5C1KN8 https://youtu.be/V6a1AW5xyAw).

On 29 April 2015, version 3 of the HEVC standard was approved. This version is in force now (at the moment of writing this column). If you would like to know more about the current status of HEVC, I recommend the video of the tutorial "HEVC/H.265 Video Coding Standard including Range, Scalable, and Multiview Extensions" presented at ICCE–Berlin in September 2015. This knowledge has not yet been included in textbooks.

Hans L. Cycon, cochair and treasurer of ICCE-Berlin 2015, associate director of daviko GmbH Berlin, and chair of ICCE-Berlin 2015 Tutorial 4, "HEVC/H.265 Video Coding Standard including Range, Scalable, and Multiview Extensions," introduced the authors of the tutorial as follows: "I have the pleasure and privilege to introduce to you a group of a very famous school from Heinrich Hertz Institute (HHI)–Fraunhofer." This is a famous group: the Image & Video Coding group of the Video Coding & Analytics Department, Fraunhofer Institute for Telecommunications, HHI, Berlin, Germany. The authors of the tutorial are Dan Grois, senior researcher and Senior Member of the IEEE; Benjamin Bross, project manager; Detlev Marpe, head of Video Coding and Analytics Department, Image and Video Coding group, and IEEE Fellow; and Karsten Suehring, project manager.

The Image and Video Coding group has contributed significantly to the entire process of the development of two generations of video coding standards including their major enhancement extensions: H.264/AVC and H.265/MPEG HEVC. The current work is oriented toward the research and development of next-generation video coding algorithms. In addition, the scientists are developing HEVC-based solutions, demonstrating the benefits of the latest standardized video coding technology.

The video of this tutorial can be found on CESoc TV. It consists of two parts:

- "HEVC/H.265 Video Coding Standard: Part 1" (duration 58:39), https://www.youtube.com/watch?v = TLNkK5C1KN8 or https://youtu.be/TLNkK5C1KN8
- "HEVC/H.265 Video Coding Standard: Part 2" (duration 2:18:06), https://www.youtube.com/watch?v = V6a1AW5xyAw or https://youtu.be/V6a1AW5xyAw.

You can also find these videos on CESoc TV by following these steps:

- select "Playlists" on the home page of CESoc TV
- find the "IEEE CESoc TV: Archive" group of playlists
- click the playlist "ICCE-Berlin 2015: Archive"

- look for the videos "HEVC/H.265 Video Coding Standard: Part 1" and "HEVC/H.265 Video Coding Standard: Part 2."

I would like to conclude with a small comment. How do you easily find a recommended video? The hyperlinks in this article do not work when the text is printed. But you can also find videos using a search engine. If you want to watch the video "Standardization of High-Efficiency Video Coding (HEVC)," for example, you can just type "ieee cesoc tv standardization of high-efficiency video coding (hevc)" in a search engine. The first item in the list will be yours.

Enjoy watching videos about HEVC on CESoc TV!

—Konstantin Glasman

State of Hardware Incubators and Accelerators in the United States

Y Combinator [1] is probably the most well-known startup accelerator; it started in 2005 with the model of providing seed investment and office hours to early stage startups. Startup founders meet with Y Combinator partners for advice to accelerate from idea conception to high-growth business. The founders also participate in weekly dinners with speakers who are successful entrepreneurs and venture capitals (VCs). The Y Combinator program is offered twice a year to two batches of startups with a Demo Day at the end of the third month for the startup to raise additional funds. While notable graduates are mostly software or web startups, including Dropbox, Airbnb, Zenefits, and Reddit, there are also a number of well-known hardware startups including the Pebble smartwatch, the Boosted board, the Edyn smart garden sensor, and the Estimote Bluetooth beacons.

Prior to the dot-com era [3], many Silicon Valley startups focused on chips and system hardware with startups like MIPS, SGI, Sun, Cisco, and Juniper. However, because of the lower investment, ROI, and risk diversification of software and web-based startups, most VC's investments have been directed away from hardware since the dot-com days. With the advancement of the cloud, sensors, and other electronics, startups like GoPro, Fitbit, Leap Motion, MakerBot, DropCam, and Nest Labs renewed investors' interest in the new hardware eco-systems under the framework of the Internet of Things (IoT).

> For new startups, it is important to understand the different resources and values provided by these incubators and accelerators.

In addition to the accelerators in Figure 1 compiled by Seed Accelerator Ranking Project [4], a number of hardware-focused accelerators and innovation centers also surfaced with some being initiated by large electronics manufacturing services (EMS) [5] [6] companies. For new startups, it is important to understand the different resources and values provided by these incubators and accelerators.

TYPES OF INCUBATORS AND ACCELERATORS

General accelerators with their own funds include:

- 500 Startups (www.500.co)
- Alchemist (www.alchemistaccelerator.com)
- AngelPad (www.angelpad.com)
- Plug and Play Tech Center (www.plugandplaytechcenter.com)

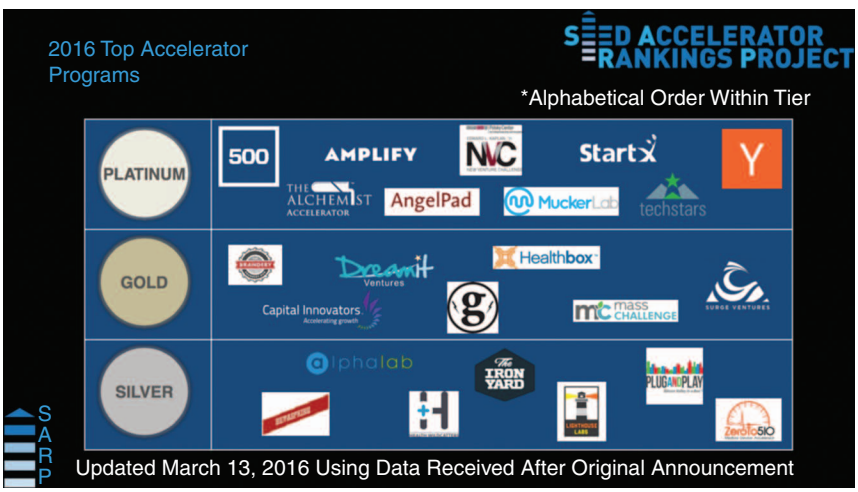

FIGURE 1. Accelerators compiled by the Seed Accelerator Ranking Project.

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